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Preferential and performance-related lateralization in volleyball as far as attack hit execution is concerned

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Abstract

This study tries to establish the preference of the players for back-row attack zones when they perform an attack hit, depending on the side they receive the ball from and if the performance of the attack hit depends on this preference. Although there is a discrepancy between the preferences for the attack zones, we have found out that there is a significant positive correlation between the preferences for attack zones when the ball comes from left side, as well as when the ball comes from right side, in practice and official game conditions. Thus, there is a direct relationship between the preference for attack zones, meaning that the same evolve in the same direction. The preferences for the back-row attack zones depend on the side the ball comes from in order to be hit.

Keywords: preferential lateralization, performance, attack hit, voleleyball

1. Introduction

Laterality is a morphological and/or functional asymmetry in limb and paired organ development. Functional laterality between skilled and unskilled side is due to a slow progression of the nervous system and biochemical processes in the brain cortex and muscles, which is an effect of certain reflexes, most of them being conditioned reflexes (Dumitru , 1986).

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The interest in laterality phenomenon in volleyball game is low and it consists mainly of approaches on ambidexterity development phenomenon.

The main cause of lateralization in athletes is the exaggerated orientation towards the execution of the exercises with the right arm during their beginner training period, as well as the trainer chase after immediate results. Thus, due to unilateral specialization, performance-related laterality is on the same side as the preferential one. Morpho-functional laterality manifests itself many times during a game: upon service, upon attack, upon taking the fundamental positions in the field, upon execution of dives (Bădău, 2006).

An inquiry was performed to know the opinion of the volleyball players about the transformation of certain asymmetrical technical actions into symmetrical actions, and the following results were obtained: 79,9% of the latter said that they felt uncertain when their game position forced them to use their unskilled hand. All subjects responded that the possibility to perform the fundamental technical actions with both their right arm and their left arm, allowed them to play more safely especially in difficult situations, and 82,9% of the inquired subjects approved the need for symmetrical training, due to the fact that during their unilateral training, they had suffered serious trauma in the shoulder and back because their dominant arm had been submitted to an excessive effort (Wiodzimierz, 1996).

Consequently, the research studies which have been performed until now have proven that performance-related laterality depends on the preferred hand and the degree the latter is exercised, as well as on certain spatial characteristics of the performed tasks, but for the time being, nobody knows if performance-related laterality in volleyball depends on the position of the player who performs an attack hit, and if so, to what extent (Croitoru, 1999)

2. Research hypothesis

This study tries to establish the preference of the back row players who perform an attack hit, depending on the side they receive the ball from, i.e. from left side or from right side, in front or back of setter and if the performance of the attack hit depends on this preference.

3. Methods and techniques

The subjects were assessed in order to establish their preferential laterality for three parameters: hand, foot and eye, by the use of HARRIS test. We have to mention that the actions used to establish the foot dominance were modified as follows: instead of the hopscotch test, the subjects were questioned on their takeoff foot when they perform an attack hit. The ocular dominance was established by modifying two actions: instead of the test called “Take the card and look through the hole!”, the researchers introduced the question “Which eye do you use to look through the viewfinder?”, and the test called “Aim a toy gun” was replaced with the question “Which eye do you use to look through a microscope?”. The test was transformed into a questionnaire. Other laterality tests for volleyball-specific techniques were also performed in practice and game conditions; the tests were performed with the right arm by 10 subjects and with the left arm by 2 subjects.

This study was performed on 12 players aged 23,8 + 7,11 years, with an average height of 195,25 + 6,08 cm, a weight of 82,41 + 5,47 kg, an arm span of 198,45 + 7,74 cm and an average period of volleyball playing experience of 12,9 – 7,10 years, all of them being A-League players.

Six of the tested athletes played on the first team and six of them played on the second team during the competition year 2011-2012. Based on the tests which were performed to establish the preferential laterality for three parameters, i.e. hand, foot and eye, it was ascertained that 10 players were right-handed and 2 of them had crossed laterality.

The tests for the attack hit were performed immediately after general and specific warm-up. The offensive player was placed in the middle front position, or zone 3.

1. The ball came from: the left side (the player hit the ball with his right hand) and it could be sent to any back row area of the court, but the subject had to specify in advance where he/she wanted to send the ball and the right side, and the same drill was performed.
2. Ten attack hits in the requested area, zone 5, receiving a pass from right side.
3. Ten attack hits in the requested area, zone 1, receiving a pass from right side.

Zones 1 and 5 are areas of land defense side, arranged diagonally from attacking player. Zone 5 is for attacking player in front-right and zone 1 is in front-left.

The training session tests were performed as follows: All subjects were submitted to one test in each training session, during the first round of the championship, in the abovementioned order.

The significance of the difference between the means was calculated for the parameters recorded during the training sessions and during the games. For this purpose, the t-test was used for comparison of the arithmetical means. The Pearson's correlation coefficient was also used to calculate the correlations between practice and game parameters. The data is presented everywhere as mean and standard deviation.

4. Interpretation and conclusions

The preferences of the players for back-row attack zones depending on the side they receive the ball from in order to be hit, in practice and official game conditions.

Table no.1 – The preferences for back-row attack zones depending on the side the ball comes from. [%, X ±ΔS, n=4]

Attack hit	Preference for attack zones			
	Zone 1 (%)	Zone 5 (%)	Zone 6 (%)	Wins out of total (%)
Ball coming from left side	47.50±20.05	36.66±25.70	15.83±21.51	93.33±9.84
Ball coming from right side	28.33±15.27	60.00±24.49	11.66±16.42	97.50±4.52

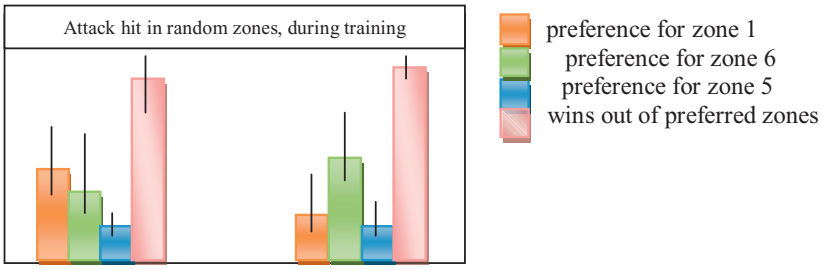

Figure 1

- (a) = significant difference regarding the preference for attack zone 1, when the ball comes from left side and right side [$p < 0.05$]
- (b) = significant difference regarding the preference for attack zone 5, when the ball comes from left side and right side [$p < 0.05$]
- (c) = significant difference between the preference for attack zone 1 and the preference for attack zone 6, when the ball comes from right side [$p < 0.05$]
- (d) = significant difference between the preference for attack zone 5 and the preference for attack zone 6, when the ball comes from right side [$p < 0.05$]

Table no. 2 – Performance and deviations recorded upon execution of attack hits in the required zones, in practice conditions. [%, X ±ΔS,n=12]

Required attack zone	Wins out of 10 required hits (%)	Deviation to the left (%)	Deviation to the right (%)
Zone 1	83.30±12.30	4.16±6.68	12.50±7.53
Zone 5	90.00±10.44	5.83±9.00	4.16±6.68

Player performance upon execution of attack hits with the ball coming from the right side and from the left side, during practice and from both sides, during the game.

Table no. 3 – Preferences of Spiru Haret Team for back-row attack zones when attacking from preferred positions, during the game [%,X±ΔS, n=6]

Team	Zone 1 (%)	Zone 5 (%)	Zone 6 (%)	Wins out of total (%)
Spiru Haret	23.87±14.59	26.42±9.07	49.65±10.01	90.55±7.34
	20.84±6.65	37.97±7.72	41.17±3.78	87.15±2.46

Table no. 4 – Preferences and performance for back-row attack zones: during practice, with the ball coming from the left side and from the right side, and during the game, with the ball coming from both directions. [%,X±ΔS, n=12]

Pass direction	Zone 1 (%)	Zone 5 (%)	Zone 6 (%)	Wins out of total (%)
Ball coming from the left side	47.50±20.05	36.66±25.70	15.82±21.05	97.50±4.52
Ball coming from the right side	28.33±15.27	60.00±24.49	11.66±16.42	93.33±9.84
Ball coming from both sides	25.71±3.61	30.92±5.71	43.27±6.56	82.95±6.49

- (a) = statistically significant difference regarding the preference for attack zone 1, between practice and game [p< 0.05];
- (b) = statistically significant difference regarding the preference for attack zone 5, between practice and game [p< 0.05];
- (c) = statistically significant difference regarding the preference for attack zone 6, between practice and game [p< 0.05];
- (d) = statistically significant difference regarding the win rate of the attack hits, between practice and game [p< 0.05];
- (e) = statistically significant difference regarding the preference for attack zone 1 and the preference for service zone 6, during the game [p< 0.05];

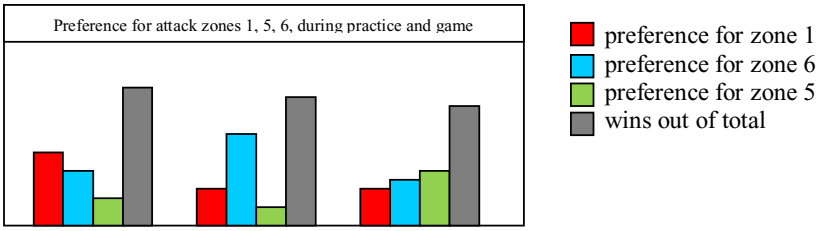

Figure 2

a) The preference for attack zones 1, 5, 6, during practice, was investigated in two situations, depending on the side the ball was passed from in order to be hit: the left side and the right side. Thus, when the ball comes from the left side, the preference for attack zone 1 is significantly higher than the preference for the attack zone 5, i.e. $p<0.005$, and when the ball comes from the right side, the preference for attack zone 6 is significantly lower than the preference for the attack zones 1 and 5, i.e. $p<0.05$ and $p<0.05$, respectively. The fact that, during the test, the players performing attack hits were placed in the middle of the front row (zone 3) allowed them to choose one of the

three zones. Zone 6 is less preferable because the blocking action of the opponents forces the offensive players to avoid this zone, which is the best defended area given that the attack system with a middle hitter in a back position is used by most of the volleyball teams in Romania. Comparing the results concerning the attack zones in the two situations (see figure 1), with the ball coming from the left side and from the right side, we ascertained a significantly higher preference for zone 1, i.e. $p<0.05$ and a significantly lower preference for zone 5, i.e. $p<0.05$, when the attack hit was performed with the ball coming from the left side, compared to the one ascertained when the attack hit was performed with the ball coming from the right side. We do not have an explanation for this situation either.

b) In official game conditions, the preference for the attack zones 1 and 5 is significantly lower than the preference for the attack zone 6, i.e. $P<0.05$ (see table 3).

By comparing the results of the players in both practice situations (with the ball coming from the left side and from the right side) and during official games, it was ascertained that:

- when the ball comes from the left side, the preference for the attack zone 1 is significantly higher in practice conditions than during the game, i.e. $p<0.05$;
- when the ball comes from the left side and from the right side, the preference for the attack zone 6 is significantly lower in practice conditions than during the game, i.e. $p<0.05$;
- when the ball comes from the right side, the preference for the attack zone 5 is significantly higher during practice than during the game, i.e. $p<0.05$.

Although there is a discrepancy between the preferences for the attack zones in practice and official game conditions, we have found out that there is a significant positive correlation of $p<0.05$ between the preferences for the attack zones when the ball comes from the left side, in practice and official game conditions, as well as a significant positive correlation of $p<0.05$ between the preferences for attack zones when the ball comes from the right side, in practice and official game conditions. Thus, there is a direct relationship between the preference for the attack zones, in practice and in official game conditions, meaning that the same evolve in the same direction.

The preferences for the back-row attack zones depend on the side the ball comes from in order to be hit.

2. The preference for the back-row attack zones depend on the side the ball is passed from in order to be hit, i.e. both from the left side and from the right side, when the players attack from the middle area (zone 3). Thus, the players have a higher preference for the zone corresponding to the direction the ball comes from, i.e. ball coming from the left side – zone 1, and ball coming from the right side – zone 5.

4. The performance-related laterality of the players we tested as far as attack hit execution was concerned depends on the side the ball comes from in order to be hit, meaning that when the player attacks from the middle area with the ball coming from the left side, the performance is better for zone 1, and when the ball comes from the right side, the performance is better for zone 5 (see figure 2).

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